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<b>(21) International Application Number:</b> PCT/US00/06447 <b>(22) International Filing Date:</b> 5 April 2000 (05.04.00) <b>(30) Priority Data:</b> 09/286,463                      6 April 1999 (06.04.99)                      US <b>(71) Applicants:</b> INTERNATIONAL PAPER COMPANY [US/US]; 1422 Long Meadow Road, Tuxedo, NY 10987 [US]; APPLIED EXTRUSION TECHNOLOGIES, INC. [US/US]; 3 Centennial Drive, Peabody, MA 01960 (US). <b>(72) Inventors:</b> WILLIAMS, Rick; 3198 W. 42nd Street, Erie, PA 16506-5321 (US). LINDBLADE, David; 744 Meadowbank Road, Kennett Square, PA 19348 (US). DRONZEK, Peter, Jr.; 6 Poe Road, Thornwood, NY 10594 (US). <b>(74) Agents:</b> GITLER, Stewart, L. et al.; Hoffman, Wasson & Gitler, P.C., Suite 522, 2361 Jefferson Davis Highway, Arlington, VA 22202 (US).			<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> OUTDOOR BANNER STOCK			
<b>(57) Abstract</b>  This invention relates to a laminated durable high yield synthetic substrate for use in printing and electronic imaging to produce durable imaged items for applications such as banners, signs and durable tags or tickets. The durable synthetic substrate of the present invention includes a nonwoven spunbonded core that has an inconsistent and discontinuous surface which is not suitable for direct printing or imaging that provides strength and tear propagation resistance. On each side of the core are laminated oriented film layers that provide high tear initiation strength and a smooth, durable and moisture resistant surface for printing and imaging. In a preferred embodiment, the substrate is coated on at least one of the two sides with a receiver coating to create receiver media for various forms of computer generated output.			

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**OUTDOOR BANNER STOCK****Field of the Invention**

This invention relates to durable and printable banners, signs and tag substrates for indoor and outdoor applications, utilizing a multilayer structure comprised of a nonwoven core and oriented outer film layers. The outer oriented film layers are adhered to each side of the core through lamination by conventional means known to those skilled in the art such as adhesive or extrusion lamination techniques. The resultant structure can be used to create banners and signs through the application of precut vinyl decorations which utilize a pressure sensitive adhesive for application. For certain applications, a coating is applied to one or both outer oriented film layers for print reception which may require a first down primer coating for adhesion to the oriented film layer. The coating can be an acrylic coating for conventional screen and flexographic printing or a specialty formulation tailored specifically to act as a receiver coating for various forms of computer generated electronic imaging.

**BACKGROUND OF THE INVENTION**

Various materials such as vinyl, TYVEK® material, extruded high density polyethylene and canvas have been used for banners, signs and tags for years. High yield spunbonded substrates have been limited for use in banners because of the discontinuous and inconsistent formation of nonwoven spunbonded products that imparts great strength to the substrate but is a poor print surface. The lamination of smooth oriented films with print enhancing coatings allows for the tear propagation resistance benefits of the nonwoven with the print enhancements and tear initiation resistance of the oriented film.

Media for electronic imaging of banners, signs and tags is a relatively new development. A variety of substrates for electronic imaging of banners, signs and tags have been produced including papers, films and fabrics. The market is in need of a variety of durable, cost effective substrates which can be used

in outdoor and indoor applications. This invention provides a novel way of producing substrates that can be made in a variety of appearances while maintaining the necessary tear propagation resistance, tear initiation resistance, "hand" and durability that is required of banner, sign and tag materials. The combination of high tear initiation resistant oriented film, and high tear propagation resistance nonwoven materials creates a very light weight (high yield) durable stock. For example, a laminate of white opaque biaxially oriented polypropylene (BOPP) on either side of spunbond Polypropylene (PP) nonwoven yields an appearance very similar to canvas. A suitable white opaque biaxially oriented polypropylene can be purchased from Allied Extension Technologies, Inc. By replacing the spunbond PP with a calendered wet lay polyester (PET) nonwoven, the appearance now becomes smooth, thereby creating a high yield cost effective alternative to white PET film and white calendered vinyl. The outer layer of OPP film can be metallized to create a totally opaque structure, thus enabling two sided printing without show through. With the metal buried in the lamination, metalizing can also be utilized to create an attractive, eye catching metallic appearance with the metal exposed below a contact clear print receptive coating.

U.S. Patent No. 5,543,191 addresses a balanced multilayer structure wherein the outer layers around a core have substantially the same thermal elongation or contraction characteristics that minimizes curl.

#### SUMMARY OF THE INVENTION

In its preferred embodiment, the invention includes a core of spunbonded polypropylene and outer layers of oriented polypropylene, preferably biaxially oriented polypropylene, with a waterproof inkjet receiving layer applied to one or both sides of the composite laminate which provides a surface capable of being imaged by inkjet printers and used indoors or outdoors. An example of how this product might be used would be for narrow or wide format inkjet printable banners and signs for indoor and outdoor use.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**FIG. 1** is a cross-sectional view of a laminate sheet embodying the present invention;

5 **FIG. 2** is a cross-sectional view of a laminate sheet embodying the present invention with a print receiving coating; and

**FIG. 3** is a cross-sectional view of a laminate sheet embodying the present invention with a metallized surface added.

**DETAILED DESCRIPTION OF THE INVENTION**

10 Figure 1 shows the construction of the basic form of the invention comprising a nonwoven synthetic material **10**, preferably spunbond polypropylene. At least one print receptive layer comprising an oriented film substrate **12** is adhered to the top face of layer **10**. At least one backing layer **14** comprising  
15 an oriented film substrate is adhered to the bottom face of layer **10**. The layers **12** and **14** are adhered to the core layer through the use of an adhesive **15** and **17**. Suitable adhesive layers can be a layer of low density polyethylene, a layer of linear low density polyethylene, polypropylene, metallocene-catalyzed  
20 polyethylene or metallocene-catalyzed polypropylene.

Figure 2 shows the composite lamination of Figure 1 with the addition of a print receiving coating **22** applied to the exposed face of polypropylene film layer **12**. The coating is applied optionally using a primer tie coat **26** to enhance bonding.

25 The receiving coating **22** is applied to the base sheet **12** with or without the use of coating primer **26**. Various coating methods can be used, such as rod coating, reverse gravure, direct gravure, mayer rod, slot die or air knife, or a combination thereof.

30 Figure 3 shows the structure detailed in Figure 2 with a metallized surface **30** on the laminated face of layer **14** buried in the lamination to provide complete opacity.

According to this invention, there is provided a durable, coated composite stock for printing on conventional and digital electronic printers. This invention contemplates durable and printable banners, signs and tag substrates for indoor and outdoor applications, utilizing a multilayer structure comprised of a nonwoven core 10 and oriented outer film layers 12 and 14. The core 10 can comprise non-woven spunbond polypropylene, meltblown polypropylene wet-lay calendared polyester, spunbonding or spunbond polyethylene terephthalate. The outer oriented film layers are adhered to each side of the core through lamination by conventional means known to those skilled in the art such as adhesive, extrusion or thermal lamination techniques. To one or both outer oriented film layers 12 and 14, is applied a coating 22 for print reception which may require a first down primer coating 26 for adhesion to the oriented film layer 12. The coating 22 can comprise an acrylic, styrene, polyester, urethane or vinyl based binder system with fillers known to those in the art of paper coating such as synthetic silica, clay, calcium carbonate or titanium dioxide for conventional screen, litho and flexographic printing. The coatings provide electronic printing capabilities and printer feeding assist properties (backside coating) for electronic printing techniques which could include wax and resin thermal transfer, direct thermal, die diffusion/thermal transfer, inkjet, piezo, electrostatic, electrophotographic, and dry toner based laser imaging. Additionally, the coating can be formulated to act specifically as a receiver coating for various forms of computer generated electronic imaging such as ink jet where the binder system can include polymers such as polyvinyl alcohol, polyvinyl pyrrolidone, gelatin and others combined with additives and fillers. Further, the preferred embodiment has the outer film layers uniformly bonded over the entire (100%) extent of the base surfaces.

Typically, oriented plastic films provide a smooth print surface readily adapted for printing and have high tear initiation strength, but low tear propagation resistance.

Spunbonded materials are not readily direct printable and have high tear propagation resistance. The composite laminated structure of this invention comprising the tear propagation resistant spunbonded core 10 with tear initiation resistant oriented film outer layers 12 and 14 solves tear propagation problem of printable oriented films. In addition, high yield products at comparable gauges are produced in comparison to alternate material such as vinyl, TYVEK® and canvas because of the low density (high yield) of the spunbonded core and oriented films. Of particular interest is a base layer of non-woven spunbond polypropylene, or wet-lay calendared polyester, meltblown polypropylene, spunbond nylon or spunbond polyethylene terephthalate. On each side of the core are laminated durable oriented film layers 12 and 14 that provide a uniform print surface, high tear initiation strength and moisture resistance. The oriented film substrates are coated on at least one of the two sides with a receiver coating 22 to create receiver media for various forms of computer generated output. Desirable film layers include biaxially oriented polypropylene, polyester or polyethylene layers.

Because of the high tear initiation strength provided by the oriented film and the tear propagation resistant properties provided by the spunbonded core, the invention can be used in place of the commercial products of the current art which employ grommets to reinforce cut holes, and are usually sewn (e.g., to create a finished banner).

The lamination of the core layer and outer layers is accomplished through the use of extrusion laminating adhesive, aqueous adhesive, solvent adhesives or 100% solids adhesive known to those skilled in the art of laminating. The three layers are preferably combined using polyethylene extrusion laminating techniques. A curtain of molten polyethylene is introduced between outer layers B and C and inner layer A and the three layer structure is then pressed (nipped) together under pressure, and cooled against a metal quenching drum. The lamination process can be done in two passes (one for each outer layer) or

in tandem (both outer layers simultaneously for improved efficiency. The use of linear low density polyethylene and other additives to toughen the lamination bond are contemplated such as metallocene.



**WHAT IS CLAIMED IS:**

1. A durable sheet laminate for indoor and outdoor applications, comprising:

5                   a base layer selected from the group consisting of: non-woven spunbond polypropylene; wet-lay calendared polyester; meltblown polypropylene, spunbond nylon; and spunbond polyethylene terephthalate, which provides tear propagation resistance; and

10                   biaxially outer layers selected from the group consisting of: oriented polypropylene film layers; polyester layers; and polyethylene layers, laminated to a first and a second side of the base layer.

15                   2. The durable sheet laminate for indoor and outdoor applications as claimed in claim 1, wherein said outer layers are biaxially oriented polypropylene film layers, and further comprising:

                  an inkjet receiver coating applied to at least one of the biaxially oriented polypropylene film layers.

20                   3. The durable sheet laminate for indoor and outdoor applications as claimed in claim 2, further comprising:

                  an inkjet receiver coating primer layer applied to at least one of the biaxially oriented polypropylene film layers, to enhance adhesion of the inkjet receiver coating.

25                   4. The durable sheet laminate for indoor and outdoor applications as claimed in claim 1, wherein said outer layers are biaxially oriented polypropylene film layers, and further comprising:

30                   at least one adhesive bonding layer applied between the biaxially oriented polypropylene layers and the base layer, to facilitate adhesion thereof.

5. The durable sheet laminate for indoor and outdoor applications as claimed in claim 2, wherein the inkjet receiver coating is waterproof.

5 6. The durable sheet laminate for indoor and outdoor applications as claimed in claim 2, wherein the inkjet receiver coating is a dye diffusion/thermal transfer receiver coating or direct thermal coating.

10 7. The durable sheet laminate for indoor and outdoor applications as claimed in claim 4, wherein the at least one adhesive bonding layer is low density polyethylene, linear low density polyethylene, polypropylene, metallocene-catalyzed polypropylene, metallocene-catalyzed polyethylene.

15 8. The durable sheet laminate for indoor and outdoor applications as claimed in claim 4, wherein the at least one adhesive bonding layers are pigmented to provide opaqueness and whiteness.

20 9. The durable sheet laminate for indoor and outdoor applications as claimed in claim 1, wherein said outer layers are biaxially oriented polypropylene film layers, and wherein the biaxially oriented polypropylene layers are white opaque biaxially oriented polypropylene, metallized biaxially oriented polypropylene, metallized white biaxially oriented polypropylene or coated white opaque biaxially oriented polypropylene.

25 10. The durable sheet laminate for indoor and outdoor applications as claimed in claim 1, wherein said outer layers are biaxially oriented polypropylene film layers, and wherein a metallized layer is placed between the base layer and the biaxially oriented polypropylene layer to provide opacity.

11. The durable sheet laminate for indoor and outdoor applications as claimed in claim 1, wherein said outer layers are biaxially oriented polypropylene film layers, and wherein the layers are laminated over an entire extent of the first and second sides of the base layer.

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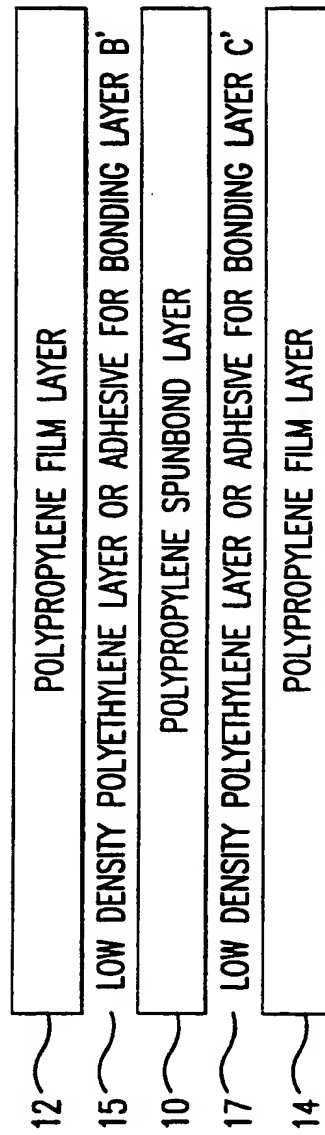


FIG.1

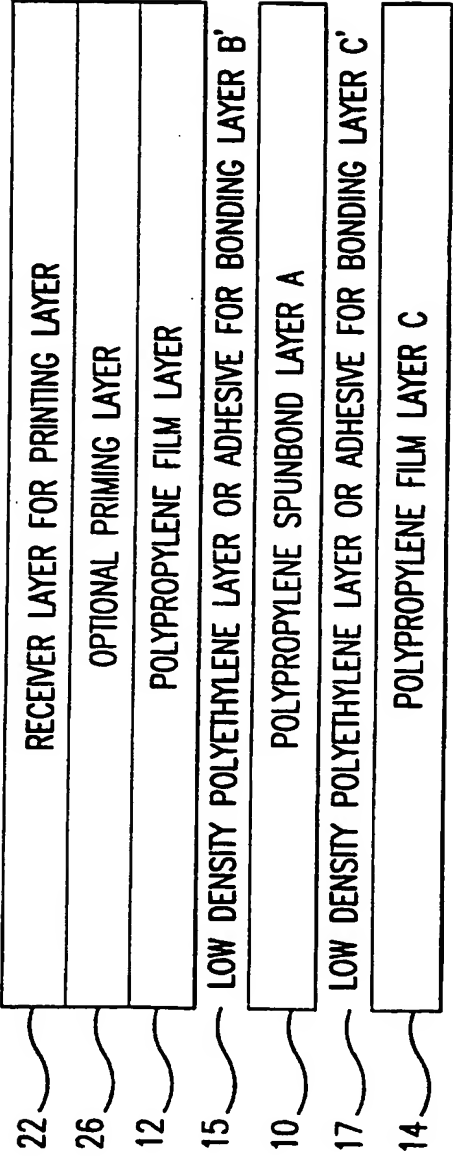


FIG.2

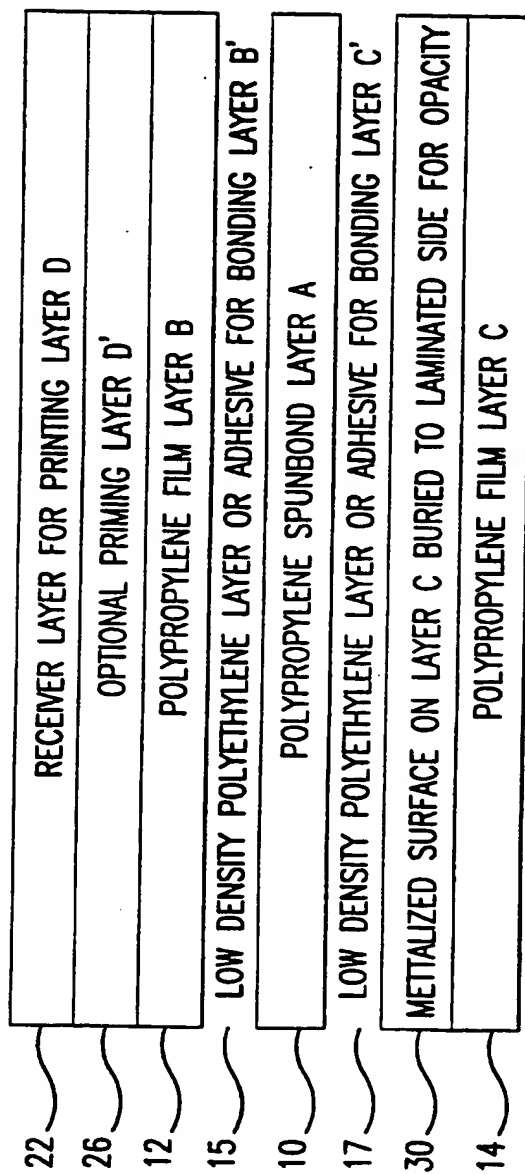


FIG.3

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/06447

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) :B32B 27/12, 27/32, 27/34; D04H 1/58 US CL :442/378, 382, 398, 400, 401; 428/ 423.5, 920 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 442/378, 382, 398, 400, 401; 428/ 423.5, 920 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,374,888 A (BORNSLAEGGER) 22 February 1983, see abstract; column 2, lines 19-49; see entire document.	1-11
Y	US 4,758,465 A (MCKINNEY et al.) 19 July 1988, see abstract; column 2, lines 3-66; see rest of document.	1-11
Y	US 5,288,548 A (WEBER) 22 February 1994, see abstract; column 1, lines 10-44; column 2, lines 10-65.	1-11
Y	US 5,578,369 A (NOHR et al.) 26 November 1996, see abstract; column 1, lines 15-36; column 2, lines 55-65; column 5, lines 42-62; column 6, lines 33-59.	1-11
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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## INTERNATIONAL SEARCH REPORT

International application No.  
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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,645,933 A (SAKAZUME et al.) 08 July 1997, see abstract; column 1, lines 9-23; column 2, lines 21-67; column 3, lines 1-54; column 11, lines 17-61.	1-11